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(54) METHOD OF CLEANING TEXTILE MATERIALS

(71) We, BROWN & GREEN LIMITED, a British Company of Chaul End Lane, Luton, Bedfordshire LU4 8HB, do hereby declare the invention, for which we pray that a Patent may be granted to us, and the method by which it is to be performed, to be particularly described in and by the following statement:—

This invention relates to a method of improving the cleanliness and quality of garments, textile piece goods and other textile articles, for example carpets and made-up curtains. For the sake of simplicity in the ensuing description and claims, such garments, piece goods and other articles will be referred to as "textile material".

In the dry cleaning of textile material it is the present practice to process the material in a liquid, substantially all of which is an organic solvent, for example perchloroethylene, at room temperature. Such dry cleaning processes fail to remove all the soil from the material and at the same time lead to excessive degreasing of the material. The fibres of the material are thus left in a dry, greaseless condition in which they are unable to hold fine particles of residual soil. This residual soil presents problems in two distinct areas. In the first place, the action of simply folding the material after cleaning is sufficient to blow air through the fibres and so release some of the residual soil in the form of dust, causing unpleasant and unhealthy working conditions in the premises where the material is cleaned. In the second place, in the case of textile materials in the form of garments, the loose residual soil has an irritant effect on the skin of the wearers of the garments.

In the dry cleaning of certain textile material, in particular woollen material, it has been proposed to add water to the organic solvent in an amount not exceeding 5% based on the weight of the dry textile material received for processing, which usually represents a concentration of water of up to approximately 0.5% by weight in the solvent in contact with the textile material. This very small quantity of water is added for the purpose of milling the textile material and has no significant effect in solving the problems mentioned above.

The present invention aims to provide an improved method of cleaning textile material.

According to the present invention, a method of cleaning textile material as hereinbefore defined, comprising subjecting the textile material to the cleaning action of a cleaning liquid comprising perchloroethylene and water, is characterised in that the weight of water in the cleaning liquid contains from 15% to 200% of the dry weight of the textile material, and that this cleaning liquid is employed at a temperature of at least 25° C but below the boiling point thereof during at least part of the cleaning action.

The method of the present invention leads to a large proportion of the above-mentioned residual soil being removed from the textile material by the water of the cleaning liquid, and at the same time the water-containing cleaning liquid does not have such a severe degreasing effect on the material. Consequently, textile material cleaned by the method of the invention has a brighter appearance than material cleaned by the conventional dry cleaning processes mentioned above. At the same time, the fibres of the material are not so severely degreased, so that they are able to retain the remaining traces of residual soil, thus largely eliminating the problems mentioned above.

The method of the invention may be performed in a cylindrical casing in which the textile material is placed, and the cleaning liquid is circulated through the casing by a pipework system comprising a pump which continually draws liquid from the cylinder and returns it to the cylinder, the circulation serving to agitate the mixture as it passes through the pump and to maintain the water in a finally divided condition in the cleaning liquid so as to assist in spreading the water evenly throughout the textile material within the casing. The cleaning liquid is raised to the desired temperature, for example a temperature of from 40° to 50° C, in any con-

venient way, for example by means of heaters fitted to the aforesaid casing or heaters arranged within the above-described liquid-circulating system.

5 A de-watering agent may be added at some stage of the process in order to assist in the separation from the textile material of the water absorbed by the material at an earlier stage of the process. This separation of the
10 water is desirable since it leads to separation from the textile material of soil which is dissolved or suspended in the water, and it also shortens the subsequent drying of the textile material.

15 In one embodiment of the invention, the method is performed in three stages. In a first stage the textile material is given a preliminary rinse in a cleaning liquid consisting of an organic solvent, for example perchloroethylene, to which no addition of water
20 is made, or only a small addition of water is made. Following this preliminary rinse the textile material is subjected to the cleaning action of a cleaning liquid comprising perchloroethylene and from 15 to 200 per cent
25 of water based on the dry weight of the textile material, this liquid also containing soap or detergent and being at a temperature of at least 25° C but below the boiling point thereof. Towards the end of this stage of the
30 process a dewatering agent may be introduced into the cleaning liquid to assist in the separation from the textile material of the water absorbed by the material. Finally, the material
35 is subjected to a short rinse in an organic solvent, to facilitate subsequent drying of the material.

40 The method of the invention may be used with any textile material provided that any colouring of the material is sufficiently fast and provided that shrinkage and felting do not take place. The method is particularly suitable for heavily soiled cotton overalls, polyester cotton overalls, wiping rags and other
45 industrial items.

The invention is illustrated by the following non-limitative Examples:—

Example 1.

50 45 kgs. of soiled, coloured industrial overalls made of cotton, polyester or mixed cotton and polyester materials is loaded into the cylinder of a dry cleaning machine which has a capacity of 1 cubic metre. 250 litres of perchloroethylene solvent containing 280 gms of a commercial grade of phosphate ester, or other
55 conventional dry cleaning additive for preventing re-deposition of soil, is then transferred from a storage tank into the drum containing the cylinder, and the latter is then rotated for 4 minutes to provide mechanical
60 action to rinse soluble contaminants and soil from the overalls into the solvent. At the end of this first rinsing process the perchloroethylene is drained into a hold-tank of the

machine for subsequent transfer to the distillation equipment of the machine for distillation and re-use.

205 litres of clean perchloroethylene is then introduced into the drum and circulated by a pump and pipework system which is arranged
70 to draw liquid from the drum, pass it through a heater and return it to the drum in a closed circuit. 45 litres of water containing 225 gms of an aqueous detergent is introduced into the pipework system upstream of the pump. With
75 the mixture of solvent and water circulating through the drum at a temperature in the range of from 40° to 50° C, the cylinder is again rotated, preferably in forward and reverse directions alternately, for a total period
80 of three minutes. A quantity of de-watering agent is then introduced into the pipework system and the cylinder is rotated for a further five minutes.

85 At the end of the treatment with the de-watering agent, the liquid is drained into a hold-tank of the machine and a further 250 litres of clean perchloroethylene is introduced into the drum and the cylinder is rotated for one minute. At the end of this rinsing operation,
90 the perchloroethylene is drained into a hold-tank of the machine and extraction of the bulk of the remaining solvent from the overalls is effected by high speed rotation of the cylinder. Finally, heated air is circulated
95 through the cylinder to effect final drying of the overalls. If desired, live steam may be injected into the drum prior to the final drying stage, which helps to achieve a crease free finish. At the end of the cleaning process
100 the overalls have a clean, bright appearance and they show no tendency to shed dust when handled.

The perchloroethylene drained from the drum at the end of the final rinsing operation is relatively clean and it may be used, without
105 intermediate distillation, for the first rinsing operation on a subsequent batch of textile material requiring cleaning.

110 A conventional emulsifying agent may be introduced into the mixture of perchloroethylene and water to improve the dispersion of the water in the solvent. Other additives conventionally used in dry cleaning and laundry
115 processes, for example optical brightening agents, may also be introduced. When white textile material is being cleaned, bleaching and/or whitening agents may be added to the mixture of the perchloroethylene and water to improve the whiteness of the material.
120

Example 2.

The method of Example 1 is repeated except that the first rinsing operation is omitted, and the textile material to be cleaned is subjected first to the cleaning action of the mixture of organic solvent and water. After this,
125 the material is rinsed and dried substantially as described in Example 1.

In Examples 1 and 2 above, the amount of water employed represents approximately 100% of the dry weight of the textile material being cleaned.

- 5 The effect of varying the proportion of water added to the perchloroethylene solvent in Example 1 is shown by the following Ex-

amples 3—7 in which the procedure is exactly the same as in Example 1 except that the amount of water added to the 250 litres of perchloroethylene solvent is as set out in the Table below, instead of the 45 litres specified in Example 1, and the quantity of aqueous detergent added is varied proportionately.

TABLE

Example No.	Quantity of water added to the perchloroethylene solvent (litres)	Quantity of water added expressed as a %age of the dry weight of the textile material being cleaned
3	4.5	10
4	13.5	30
5	22.5	50
6	67.5	150
7	90	200

- 20 The cleaned textile material obtained from Example 3 does not exhibit the dust problem, mentioned above, which is encountered with textile material cleaned by conventional dry cleaning processes. The cleaned material, however, has an unsatisfactory grey appearance arising from redeposition of soil from the cleaning liquid. On the other hand, the cleaned textile material obtained from each of Ex-
- 25 amples 4—7 has a clean, bright appearance in addition to showing no tendency to shed dust when handled. Generally speaking, the high proportions of water are to be preferred, especially when the textile material is heavily soiled, but no improvement in the finished effect of the cleaned textile material is apparent when the proportion of water is increased above 200% based on the dry weight of the textile material. On the other hand, increasing
- 30 the proportion of water above this figure makes the method more difficult to operate and less economical, since larger quantities of detergent and de-watering agent are required, and more water has to be removed in the drying of the cleaned textile material.

- 35 In Patent Specification No. 973,033 there is claimed a method for the chemical cleaning of textiles by means of an organic solvent-cleaning liquor, e.g. tetrachloroethylene, where-
- 40 in to said solvent-cleaning liquor a quantity of water exceeding the usual content of water of 0.2 to 2 grams per litre by a multiple of more than 10 up to 50 times is added, and wherein during the cleaning operation an air

current is blown through the treatment vessel. We make no claim herein to a method of cleaning textile material in which, during the cleaning operation, an air current is blown through the treatment vessel.

Subject to this disclaimer, WHAT WE CLAIM IS:—

1. A method of cleaning textile material as hereinbefore defined, comprising subjecting the textile material to the cleaning action of a cleaning liquid comprising perchloroethylene and water, characterised in that the cleaning liquid contains from 15% to 200% of the dry weight of the textile material, and that this cleaning liquid is employed at a temperature of at least 25° C but below the boiling point thereof during at least part of the cleaning action.

2. A method according to claim 1, in which a de-watering agent is added to the cleaning liquid after the textile material has been subjected to the cleaning action of the cleaning liquid, in order to assist in the separation from the textile material of the water absorbed by the textile material.

3. A method according to claim 1 or 2, in which, prior to the cleaning action of said cleaning liquid, the textile material is given a preliminary rinse in substantially pure organic solvent.

4. A method according to any of the preceding claims, in which, after the cleaning action of said cleaning liquid, the textile

material is given a rinse in substantially pure organic solvent.

- 5 5. A method according to any of the preceding claims, in which said cleaning liquid is employed at a temperature in the range of from 40° to 50° C.

6. A method of cleaning textile material as hereinbefore defined, substantially as described in either of Examples 1 and 2.

- 10 7. A method of cleaning textile material as hereinbefore defined, substantially as described in either of Examples 4 and 5.

8. A method of cleaning textile material as hereinbefore defined, substantially as described in either of Examples 6 and 7.

9. Textile material as hereinbefore defined, when cleaned by the method claimed in any of the preceding claims.

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